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Chapter 13

POSSIBLE INFREQUENT GEOPHYSICAL SOURCES OF CLOSE UFO ENCOUNTERS: EXPECTED PHYSICAL AND BEHAVIORAL-BIOLOGICAL EFFECTS

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The problem still remains that in a few cases individuals appear to have been exposed to some stimulus that elicited profound psychological and physiological changes. Although the ad-hoc (or after the fact) descriptions of the event may in no way reflect the actual stimulus, the origin of the phenomenon must still be isolated. The following theory is presented to accommodate some of the more pronounced close encounter UFO cases. It will not and cannot explain all UFO cases--from the bizarre movements of a light in the sky to the clear psychological difficulties that characterize some alleged contactees--since the term UFO has been applied widely and indiscriminately to myriad events with unspecified sources. Like any theory, its strength will depend heavily upon compatibility with existing data patterns, internal consistency, relationship to known and previous natural principles, and most importantly, the capacity to quantitatively predict the phenomenon in question.

The UFO research area has been plagued with a lack of testable theories, a problem that primarily reflects the unscientific background of the majority of investigators involved, heavy reliance upon the face value of human report, and the total dependence upon ad-hoc examination and explanation of the data. There is a critical difference between gross speculation and after-the-fact explanation (which composes most of the extraterrestrial arguments) and systematic theorization. The theories of D. Menzel and P. J. Klass, for example, are based upon sound physical principles that can generate testable hypotheses and be subject to empirical examination. These theories at least have the potential to predict the phenomenon in a quantitative fashion.

The present theory is derived from the assumption that as yet some unspecified, infrequent, natural terrestrial

processes are primarily associated with the clear physical data associated with UFO instrumental measurements (such as photographs of luminous stimuli), electromagnetic occurrences and biological-behavioral effects. It should be regarded as probationary until the hypotheses generated from the basic assumptions have predicted the space-time characteristics of forthcoming UFO events. The present theory is intended as a model to demonstrate the important difference between theoretical testing and general speculation, and the thesis that many natural possibilities must be examined before all-or-none acceptance/rejection of the extraterrestrial explanation is seriously entertained. There is neither personal commitment to the theory nor the contention that it is the only option.

Essentially, the theory states that normal geophysical processes applied in unusual space-time configurations are responsible for electromagnetic phenomena that have direct physical and biological consequences. These processes involve normal alterations in tectonic (structural) stresses within the earth's crust and are mediated by piezoelectric-like effects. The primary natural analog of this putative phenomenon would be earthquake lightning and the variety of luminous shapes and forms reported for centuries to be associated with earthquakes. Whereas earthquake-related luminosities appear contingent upon large releases of structural strain (seismic activities), the luminosities and electromagnetic correlates of alleged close encounters with UFOs are associated with highly localized, less intense changes in crustral structures not necessarily involving major seismic activity.

However, since the two phenomena are assumed to share a similar mechanism, clear, seismic-correlated UFO-like displays should reflect the basic characteristics (but at more intense levels) of non-direct earthquake-related forms. It is realized that any similarity between the two phenomena may be spurious and reflect an erroneous "similar plus similar equals same" reasoning. The attenuation of this possibility depends upon the number of details and precision of descriptions predicted by the model.

SEISMOELECTROMAGNETIC PHENOMENA

Earthquake-Related Luminosities: Historical Accounts

UFO-like luminous displays and correlative electro-

magnetic phenomena have been associated with some earthquakes for centuries. Yasui (1974) reports that Japanese accounts of these phenomena have been recorded for about 1500 years while European reports have been known for about 800 years. In 1931, Terada reported the available evidence for earthquake-related luminous displays that are now grouped under the general heading of earthquake lightning (EQL). Terada reported a classification scheme published by I. Galli in 1910 to describe the basic patterns of historical earthquake-related luminosities. Reports of EQL within the last 20 years indicates that Galli's classifications are still appropriate. According to this scheme, luminous earthquake-related phenomena involve indefinite instantaneous illumination, well-defined and luminous masses, bright flames and emanations, and phosphorescence of sky and clouds.

The second class of earthquake lightning is most relevant to the UFO problem. Further divisions of this category by Galli involved the report of fireball shapes, fire-column shapes, beam of fire or searchlight-like occurrences, and luminous funnel (triangle) shapes. Terada reports several historical accounts of these EQL manifestations. A fireball resembling a paper lantern was reported flying through the sky before a local earthquake in Yedo, Japan, in 1672. In the case of the Tossa earthquake of 1698, a number of fireballs shaped like wheels were seen flying in different directions. Before the Sinano earthquake of 1847, "a fiery cloud appeared in the direction of Mt. Iduna. It was seen to make a whirling motion and then disappeared. Immediately afterward, a roaring sound was then followed by severe earthquakes."

Between 1900 and 1930, several Japanese accounts of fireball or searchlight phenomenon were reported to occur during the 24-hour periods before and after earthquakes; the severity of the earthquakes themselves did not appear to be a critical factor per se. In 1917, a fire column was seen in the mountains north of Siduoka, and on September 1, 1923, a stationary fireball was reported over Tokyo. Following the first shocks of an earthquake in 1924, a pillar of fire over the roof of a house was seen; the pillar of fire was slightly bent with its concave side to the right while its upper end merged into a diffuse sheet of light attaining a considerable altitude. During the aftershock of the Tazima earthquake on May 23, 1925, a luminous ball (something like a football) in the sky was reported; it moved rapidly from northeast to south like a shooting star and then disappeared. One fireball,

observed during a local seismic display in 1930, was noted to be stationary for a period and then moved upward and vanished, followed by luminosity in all directions.

Terada scrutinized the details of reports concerning EQL following the earthquake of November 26, 1930, in the Idu district; the data were primarily collected from questionnaires circulated to the masters of middle schools in adjacent prefectures. Unfortunately, Terada does not publish the questionnaire format; as a result, it is not clear how the questions were asked. This factor is very important in situations involving transient, unusual events since the label given after the observation may influence the recall and verbal behavior about the event.

From 1168 reports, Terada summarized the general patterns observed. For example, a number of fishermen who were about to set their boats afloat the evening before the earthquake observed a spherical luminous body to the west of Mt. Amagi which moved at considerable speed. In addition to the usual sheet displays, luminous beams and columns were also seen at different places by hundreds of witnesses; the beams and columns appeared to be manifested in a variety of forms, directions and modes of motion. Ball-form and funnel or trumpet-form luminosities were observed near the epicenter.

During the shocks, flashing lights were seen in several places, "moving now in one spot and then in another, thus successively in different places." When the earthquake was at its height, "a straight row of round masses of light" (Terada's emphasis) was seen. "Each of these luminous bodies was seen to be in revolving motion. The brightness was considerable. Their heights seemed to be equal to the top of the poles of transmission lines." Some lights varied direction. One light "... first appeared above Mt. Hakone and was seen to be propagated southwards, towards Mt. Amagi. Then it reversed in its direction of propagation and went back towards Mt. Hakone." The colors of the luminous displays were primarily pale blue white or similar to an electric spark or lightning. However, a large number of the witnesses were "sure" that the color was reddish or orange in color. Reddish or scarlet tinges and glows and the like are compatible with reports of earlier investigators as well.

The descriptions of Takata, Galli, and others represent some of the most typical and elusive aspects of alleged

UFO sightings. Reports of luminous glows or "masses" with variable shapes and characteristics are found in copious numbers within the UFO literature. Contrary to popular belief, photographs and moving pictures of UFO objects are primarily undifferentiated luminous displays and not structural, metal objects. As Klass (1974) points out, the majority (if not all) of the structural photographs have been demonstrated to be or are very likely fraudulent or contrived.

The spheroid type of EQL also displays other properties typically attributed to UFOs. In addition to the trumpet shapes, triangle shapes or football shapes, these luminous displays exhibit quick alterations in direction and acceleration, including "right-angle turns" and sudden "elevations." Multiple clusters of luminous spheres have been noted to assume a number of geometries from wheels to straight lines. Similar reports of "squadrons" or geometric clusters of luminous lights have occurred in the UFO literature. Thunderous roars, explosive sounds (although infrequent) and flashes of light have been mentioned to follow the disappearance of luminous displays. Like UFO descriptions, colors of EQL spheroids have been primarily whitish to bluish or reddish. Changing colors may occur in both stationary and moving luminosities.

Recent Accounts of EQL

Yasui (1974) has published photographs and details of EQL during the Matsushiro earthquake swarm of 1965-1967. According to his report, the following correlates are associated with EQL displays:

Spatial Locus: EQL is most likely to occur on hill tops or high mountains; in the majority of instances, it occurs near but not at the epicenter (Derr 1973). Terada mentions EQL reports up to 100 km from epicenter.

Geological Conditions: EQL is most likely to occur around old volcanoes or strong acidic rock areas such as dacite, granite or dorite. The phenomenon appears especially likely around fault areas and outcrops of quartz diorite. Yasui reports measurements of increased carbon dioxide in the free air and soil gases near the outcrops of faults. In addition, the area of diorite outcrops at Matsushiro show an extraordinarily high natural radioactivity. Yasui thinks that the soil air under the strong acidic rock contains much

radon, such that the radon content near the outcrop may become quite high following the stress effects of an earthquake.

Meteorological Correlates: For the Matsushiro clusters, EQL seemed most likely before the passage of cold fronts; proportionally more episodes were seen in the winter.

EQL Characteristics: In the Matsushiro region (one should realize that the specific form of EQL appears dependent upon the local topography and geology; consequently, there may be some range in quantitative values), the main luminous body of EQL displayed a flattened semisphere (lower fringe on the earth's surface) with a diameter between several tens of meters to about 100 m. In one instance, several witnesses saw the luminous hemisphere of this episode rise up from the hill top and then descend. The color, primarily bluish white, may be altered by clouds and refractive dynamics to reddish, orangish or purplish, although all colors have been reported as well as changing colors. Luminescence duration ranged from 10 seconds to 2 minutes and predominately occurred after the quake.

Electromagnetic Correlates: Yasui and others have reported strong atmospherics (naturally-produced electromagnetic waves) especially between 10 kHz (10,000 cycles/sec) and 20 kHz following the luminous displays. However, there appears to be more central, intense electrostatic or extremely low frequency (about 0.1 Hz to 10 Hz) phenomena as well. In conditions associated with EQL, St. Elmo's fire may be found around electric charge collectors such as telephone poles, electric wires and related objects. Before the use of power lines, similar St. Elmo's displays occurred around steeple tops, ship masts and related structures.

Derr (1973) also has reviewed the literature on EQL. He mentions several examples of EQL in the United States. Flashes of light and related luminosities have been reported before, during or following a number of earthquakes in California between 1872 and the present. Reports of what appeared to be bolts of lightning traveling from the ground towards the sky were recorded from witnesses following the Humboldt County earthquake of 1932. Earthquake lightning appearing as sequential flashes from different, random places were noted following two earthquakes near Hollister, California, in 1961. During the Santa Rosa earthquake of October 1, 1969, lights were seen extensively and described in terms of electric sparks, lightning, St. Elmo's fire, fireballs

or meteors. Some people heard sounds like explosions. Yasui (1972) commented in more detail on the Santa Rosa episode. Apparently, reports of a ball of light prior to the earthquake were reported. The details of the observations displayed great variation from "the light started near the ground and rose up, and the basic shape was tubular" to "it was a purple colored light like a bomb explosion."

Correlative alterations in biological objects adjacent to the luminosities have not been reported. Several Japanese investigators who visited the general areas of the luminosities after the episodes found no observable evidence. Any effects found on trees or plant life in the vicinity would not necessarily imply luminosity interactions. More direct effects could be involved. Derr (1973) mentions that movement on a fault can generate considerable heat. For example, after the Sonora earthquake of 1897, trees overhanging the fault were scorched. Human injury or death from EQL has not been reported. Such deaths would have been allocated to direct earthquake causes; there are few postmortems after earthquakes.

Other impressive displays of EQL and related luminosities were reported for the 1966 Tashkent earthquake in the Soviet Union, in Mexico City during the 1957 Acapulco quake, and in the Los Angeles area during the San Fernando earthquake of February 9, 1971. In some instances, fluorescent lamps began to glow without the use of conventional power sources. Derr's review includes the personal communication of an observer of the July 16, 1973, earthquake on the coast of Guerrero State (Mexico). After the quake, a strong noise on the FM radio in the reporter's car on all stations was noted for about five minutes. These data suggest that EQL displays are electromagnetic phenomena.

The relevance of the more recent EQL correlates to the UFO problem is also apparent. In fact, Derr (1973) frankly states that the study of earthquake lights also leads to investigation of UFO reports from nearby areas. Certainly the radio disturbances, effects upon electrical apparatus, and in some instances, alterations in animal behavior that occur before or after EQL displays is similar to conventional close encounter UFO cases.

Theoretical Explanations

Theoretical interpretations and explanations of earth-

quake lightning have been suggested by Terada (1931), Finkelstein and Powell (1970), and Yasui (1972); reviews of present theories have been reported by Yasui (1972) and Derr (1973). One of the most likely mechanisms of EQL involves the piezoelectric effect whereby mechanical stress/pressure upon certain types of rock crystal generates large electric potentials but very small currents. In an unpublished paper, Finkelstein and Powell develop the necessary equations to support their hypotheses and compare known quantitative measurements. The maximum piezoelectric potential difference would be a function of the spatial form of stress applied to the rock, rock distribution, the temporal form of the stress, the time constants of the media, the piezoelectric characteristics of the rock body, the scale of the stress change in the rock, and the length of the process.

Using stress changes of between 25 and 250 bars (measures of pressure) for epicenter values (an upper limit would be set by the strength of the rocks, e.g., around 1000 bars) and high resistivity materials, Finkelstein and Powell calculate that potential differences of about 100 million volts could occur, with small currents. These values could produce ionization or discharge in local air. According to their model, areas with excess quartz should be good candidates for the EQL mechanisms and since earthquakes typically occur in acid, high-silica areas (apparently because such rocks are more brittle than basic rocks), it is likely that such areas would hold rocks with excess quartz. The outcrops of quartz diorite in EQL areas reported by Yasui have been mentioned.

Finkelstein, Hill and Powell (1973) report an initial empirical test of their piezoelectric theory. Data collected in the area of the unusual lights seen during the San Fernando earthquake of 1971 indicated that the rocks did not have the appropriate resistivities to accommodate their models. However their measurements involved shallow depths and localized regions of examination.

UFO DISPLAYS AS TECTONOGENIC ELECTROMAGNETIC PHENOMENA: PHYSICAL CHARACTERISTICS AND PREDICTIONS

The UFO Model: General Rationale

Characteristics of this model have been discussed by

Persinger and Lafrenière (1977) and Persinger (1976). Essentially, the model assumes that geophysical processes similar to those associated with largescale earthquake lightning are produced at lower magnitudes within very localized areas without immediate or major fracturing and related seismic activity. Within these localized areas, in the order of 100 to 10,000 square meters, intense electromagnetic (EM) forces are generated for short durations, in the order of seconds to minutes. These hypothetical EM fields will be called EM columns and will be assumed to represent aberrant concentrations and overlapping of EM flux lines. Such alterations in flux lines would produce a condition that can be described metaphorically as an "electromagnetic tornado," within which luminous potentials could be achieved or plasma environments could be maintained for short periods. The changes in subsurface strain release associated with the EM column would be inconsequential from a global or general theoretical perspective--in this context, the energies involved are too minute for consideration. However, these miniature localizations could be well within the range of perception by a human observer. It is often forgotten or unrealized that the human species lives upon an ultra-thin shell of not always stable material beneath which mammoth processes are generated influencing thousands of square kilometers.

The oddity of the phenomenon lies not in the particular physical principles of tectonic forces or electromagnetism but instead within the complex geometries in which they are applied. The unusual factor involved here is the observation or manifestation of these forces in very small areas relative to the total space over which the forces are applied. One would expect minute disparities in the distribution of these forces within heterogeneous media. Examples of this principle exist in chemistry at the level of the molecule. In a glass of water, one would expect from gross observation (at the level of the total volume of water) that the water molecules are homogeneously distributed throughout the volume. However, if proteins were placed in the water, very small increments of space in the order of 10^{-18} of the total volume would occur within which no water molecules existed (hydrophobic pockets). These minute volumes would show unusual or aberrant properties in acid-base values and related physical characteristics; they could even display charge characteristics orders of magnitude different from adjacent regions. Because of the relative size of these volumes, the large extremes in physical values would be eliminated (averaged out) or fall within the statistical noise level of measurement when observations were considered at the level of the entire volume.

A similar principle can be applied to still larger volumes of space. For example, the thermal processes associated with a weather mass produce a small breeze when distributed over, say a 1000 by 1000 km region. However, when similar processes are concentrated into a small region of space, less than one square kilometer, intense and deadly turbulence results: the tornado. Not only does the magnitude of the forces increase but some of the characteristics not detectable by the human observer at the larger areas of occurrence become blatant. Characteristics of rotation, oscillation and correlative electromagnetic displays become apparent. Some of these characteristics may be unique to the rotational areas involved such as specific infrasound frequencies. At this level of localization, a multitude of variables, otherwise considered statistical and insignificant, become important factors in the control of the complicated movements of this energetic space.

Geophysical scientists often do not acknowledge that little is known about minute boundary effects or nth-order interactions within heterogeneous materials when general principles/equations are applied homogeneously to extremely large spaces (such as the volume of a planet). The consequences of small deviations in the distribution of force applied over an entire system to an area 10^{-12} of the area of the total system still have not been entertained seriously. These minute "pockets of stress" would be insignificant over the entire system but very powerful locally. Such local tectonic conditions would be responsible for UFO-stimuli. A number of predications can be generated from the theory.

Electromagnetic Column and Luminous Body Shapes

As mentioned, the basic shape of the EM column has been assumed to be cylindrical in nature. The actual diameter may vary; conceivable diameters range from less than 10 to about 100 m. Maximum height values are not directly apparent from the assumptions of the model. Luminosity associated with an EM column should vary in size as a function of the column's size, which in turn would reflect the energy involved. Large columns could involve sufficient electric potentials to induce very large currents in available conductors.

More than one column could be generated from local tectonic conditions. Several columns could occur in close

spatial association and produce luminous clusters of lights. Major disturbances over areas of 10,000 to a million square kilometers could be prone to tens of such columns generated in a short time. However, not all columns would approach field values sufficient for luminosity.

Luminosity and luminosity shape conditions constitute a major limitation of the model. Frankly, it is not clear how the luminosity could be contained in a small space (without dispersing in all directions like fireworks) for durations (in the order of seconds to minutes) typical of UFO stimuli. A possible natural analog for this mechanism involves the production of ball lightning. This EM phenomenon is associated with luminous, highly energetic, coherent, spherical formations lasting for several seconds to about a minute. Living organisms closely approaching ball lightning can be seriously injured or killed. The underlying mechanisms are not clear, although considerable theoretical considerations have been made for plasma-like conditions. Contemporary theories require massive tangling and concentration of electromagnetic flux lines for these periods.

The shape of the luminosity should be predominantly spherical or elliptical due to the natural geometries of charged distribution. However, severely ellipsoid manifestations could appear in a number of forms depending upon the angle of observation. Vortical rotations of the EM column would also rotate the axis of the luminosity.

A significant portion of the model depends heavily upon the complex geometry of the interactions of applied forces as the source of the odd displays. Natural examples do exist, such as the tornado, that demonstrate these effects. On the other hand, excessive reliance upon complex vectors as the "explanation" for the model's failure of prediction may approach the level of rationalization rather than insufficient data.

Geological Characteristics of Locality

UFO displays should be prone to occur in areas with large proportions of materials displaying the high resistivities (in the order of a billion ohm-meters) suggested by Finkelstein and Powell for earthquake luminosities. The location of the appropriate materials may be variable and could occur below a more conductive surface area. Since water levels

contribute significantly to the resistivity of subsurface minerals, factors that increase the resistivity should increase the likelihood of UFO displays in that area, assuming appropriate strain conditions. In some regions drought may be sufficient to significantly alter the water table and enhance the resistivity of near-surface candidate materials. Candidate materials would involve granite with large amounts of quartz, as suggested by Finkelstein and Powell and Yasui.

UFOs and Seismic History

Since localized accumulation of strain within subsurface rock structures of optimal resistivity and crystal structure has been considered the primary source of piezoelectric-like effects associated with UFO displays, factors that facilitate the accumulation and/or release of tectonic stress should be correlated with UFO reports over time. Slow accumulation of strain or slow tectonic changes would be required since sudden intense changes would fracture the supportive rock structure and eliminate or attenuate any piezoelectric possibilities. As Derr points out, EQL appears to occur never over the epicenter but at some distance away where non-fracturing but optimal strain levels could initiate changes in appropriate rock structures.

With this assumption, one would predict that UFO displays should occur more frequently in areas typified by earthquakes, especially those preceded by long periods of stress accumulation. Sample areas would be the New Madrid region in Missouri, Illinois (and surrounding regions), or the New York region. California would be still another excellent candidate. The critical feature is the accumulating strain on appropriate structures; consequently, seismic activity at any given time may not be correlated with UFO displays. Strain levels are known to increase or decrease in some areas without major fracturing and seismic activity. However, over intervals of time representative of several adjustment periods, UFO profiles should be apparent within these areas (see Persinger 1976).

UFO displays could both precede and follow seismic events by weeks to months. Such displays preceding seismic events should be (theoretically) more frequent and could occur during longer time intervals before the earthquake while UFO events following seismic changes should decrease quickly as the fractured rock structures readjust. However the num-

ber of UFO displays should be correlated with the amount and duration of after-shocks and microseisms during the adjustment. If the geometries were not too complex and if sufficient geological information were available for UFO prone areas, the rapid increase in sighting of these displays could be used as prognosticators for changes in tectonic stress. These possibilities have been either suggested or stated by Derr (1973), Finkelstein and Powell (1970), and Wiedemann (1977).

Precipitating Stimuli

Assuming that optimal stress geometries had been applied to prone minerals, some specific stimulus must precipitate the actual display of the luminosity. These stimuli could be quite small relative to geophysical standards and would be analogous to the "straw that breaks the camel's back." Natural stimuli that would be included as candidate trigger stimuli are further accumulating tectonic strain, passage of the moon (tidal forces), and quick and sudden passages of air masses, especially frontal movements (providing different barometric pressures on supportive rock structures). Possible local man-made trigger stimuli would include reservoirs (especially if the total mass/volume underwent relatively marked alterations in a period sufficiently small to require readjustment of circumreservoir rock matrices), large explosions, and induced slippage from subsurface waste disposal. Localized effects in small prone areas due to largescale alterations in entire crustal blocks or segments would be still another possibility. In this instance, stress distributed across the block would be statistically distributed to prone areas. However, the vectorial solutions would be very complex and analogous to calculating specific force depositions within a large, very heterogeneous crystal lattice. Because of the large forces involved, any extreme spatial localization could actually fracture the rocks very quickly. Other candidates of this order would be intense solar storms that undergo 11- to 12-year cycles, distant seismic activities, and correlates of the Chandler wobble. At present, consideration of such forces is empirically prohibitive.

Topographic Locations

Since it may be assumed that UFO "lights" are a consequence of tectonic stress associated with electric field poten-

tials that achieve luminogenic values, these light displays should occur in areas that would allow maximum concentration of the electric field and ionization potential. Apices and edges of materials could act as "discharge" points. Consequently, like earthquake lightning, such luminous displays should occur on the top of hills, peaks of mountains or bluffs or near the tops of buildings. Other charge collectors would be important contributors to the luminous capabilities of the electromagnetic column. As a result, UFO reports should be evident around power lines, power stations and less energetic materials such as railroad tracks and pipelines. These areas should be clearly evident in UFO area patterns. However, the optimal structural geometry may be buried beneath the surface as well, in which case surface topography would not be a reliable cue.

Apparent Movement Effects

If the source of the luminosities is associated with tectonic strain, movement of the strain source due to changing or stress-release factors should be reflected in the three-dimensional activity of the luminosity. Since tectonic stress release and associated movements tend to occur along local fault lines, UFO paths should closely follow these patterns. On a regional scale, UFO reports should cluster in general along active fault lines at perpendicular distances sufficient to allow optimal piezoelectric pressures.

Since the locus of the subsurface sources exists in three-dimensional space, any movement in the stress source should be reflected by the luminosity, like a "transformation of axes" on the earth's surface. Thus the object could appear to move from side to side, up or down, or suddenly shoot into the air or "crash" into the ground, depending upon the subsurface movement. Sudden displacement of the sources along stress lines and secondary faults would be associated with "high-velocity" and/or "right-angle" movements of the luminosity.

"Landing Phenomena"

If the EM column associated with subsurface forces moved over a conductive region, current flows could result that would be sufficient to kill plant life or alter the physical properties of appropriate minerals. Residuals of common

elements found in minerals should be found in the vicinity (which could be called a "saucer nest") such as aluminum, iron, silica, etc. Electromagnetic column-mediated release of subsurface radioactive substances (if any) would be apparent.

Electromagnetic Effects

Since the EM column is sufficient to induce luminosities in the air, passage of the column over electrical/conductor systems should induce EM disturbances. Electrical appliances such as televisions and radios would malfunction ("go dead"). As mentioned with earthquake lightning, atmospheric frequencies generated around the column should induce significant noise ("static") and mask signals from adjacent radio stations. Low-frequency components of the column would induce similar frequency effects in power lines and telephone lines--the latter may be experienced by the human observer as sounds like "breathing," "whishings" or "beeps." Because of the high electrostatic potential involved, light systems in cars would also be influenced as well as automobile engines because of effects across the spark-plug gap. Passage of the EM column over optimal conductors such as fuse boxes or high-density electronic wiring would be sufficient to melt or "blow out" the contents. Compasses would also "go wild."

If the EM column moved beneath or adjacent to power lines, significant induction and overloading could occur at local transformer stations producing blackouts. The luminosity also might affect radar propagation. Such modification would be interpreted as an "object" in a manner similar to detection of certain atmospheric turbulence. As the EM column potentials fell below luminogenic values, the radar image would be seen to "fade away."

Cultural Confounding Variables

The tendency for UFOs to move along roads or pathways or related linear lines should be correlated with local geological features; labeling this as "intelligent movement" would be an erroneous interpretation of systematic activity. For example, roads are often built in relation to accessible topographies such as along or parallel with old river beds, valleys, gullies and other regions beneath which local or

small fault lines may be located. UFO occurrences in isolated regions where installations (e.g., atomic reactors, military plants, reservoirs) are constructed would represent the nature of the geological structures. Hard, acidic granite-related areas that may not have been conducive to early farm life or community building (and hence little population density) would be optimal areas to build such plants. The location of the UFOs in this locality would reflect the subsurface rock strata and not the "importance" of the cultural constructions on the surface.

Localized Historical Accounts

Since tectonogenic mechanisms can be shown to be associated with UFO luminosity production, historical reports of UFO-related phenomena in areas prone to low-level and slow-accumulating tectonic strain should be evident. No doubt the occurrence of any UFO-like luminosities or events would have been influenced by the metaphorical labels of the period. Areas prone to "ghost light" like phenomena such as the one investigated by Wiedemann (1977) and his colleagues may have been called haunted, bewitched, taboo or the habitat of an invisible or spirit entity. Consequently, unusual events in these areas may have been classified under parapsychological or occult rubrics. In some cultures, these areas may have acquired significant religious or superstitious significance.

Since human verbal behavior in the context of these stimuli is prone to serious methodological and measurement limitations, precise details for the historical descriptions of these events may be irrelevant or even misleading. The investigator could attempt to isolate references to electromagnetic effects and related displays, but this too would be limited by the relative paucity of electromagnetically-affected objects (with the exception of the human being) before the turn of the century. Oddities in compass movements, smoke paths, accumulation of clouds on a clear day or direct biological effects (paralysis or blackouts) may have been reported.

General Support Data

The predictions of the model are primarily qualitative at present. Quantitative evaluations are limited by incomplete data pools for UFO phenomena, biased data categories

from investigator effects and arbitrary labeling, and few inter-correlation studies between UFO events and the mechanisms suggested in this model. However a few trends suggest that further testing of the theory is warranted.

A major prediction is a significant correlation between UFO reports and seismic profiles, especially low-intensity earthquakes. Persinger and Lafrenière (1977) analyzed UFO reports between about 1860 and 1972 in states bordering and east of the Mississippi River. These states were selected because there has been a sufficiently large population in these regions for detection of major UFO events during the years analyzed, and the states range from active seismic histories to almost no activity. These researchers found a correlation coefficient (r) of +0.58 between UFO-related reports and minor earthquake activity (Mercalli V to VI). Although statistically significant, the correlation was confounded by population numbers which also significantly correlated with seismic history. Path analyses were inconclusive.

These analyses were much too general. Correlations should be calculated between specific classes of UFO types and seismic activity in immediate and adjacent spatial increments since stress values optimal for EM column production may occur at distances from the epicenter. Possible supportive structures for EM column production would be eliminated in epicentral regions. Statistically, one would expect the distance of luminosity production to be directly proportional to the intensity of the earthquake. Considering the periodic functions of candidate trigger stimuli, the time between the luminosity and "seismic event" should vary from one to 28 days. However the critical feature would be the rate of stress accumulation. With such temporal delays between the luminosity and seismic event, lag analyses must be completed on available data. The relationship between UFOs and earthquakes is not a unique consequence of the present theory. Other investigators, as mentioned by Creighton (1971), have suggested a relationship in the other direction, i.e., that UFOs cause earthquakes. The present model demands that a third factor elicits both phenomena.

A more reliable general support of the theory derives from the characteristics of the UFOs. As mentioned by Klass (1974), there are few pictures of UFO-labeled objects displaying structural characteristics (doors, windows); these are suspect. The vast majority of UFO photographs and films show intense blobs of lights at night or dark regions during

the day. Such photographs have been taken worldwide (e.g., Ben 1970, Gheorghita 1973, Takanashi 1972). These light blobs display characteristics remarkably similar to earthquake lightning and related natural electromagnetic phenomena such as ball lightning except no contiguous seismic or thunderstorm activity is apparent.

A more specific support case has been reported by Wiedemann (1977) who has summarized the conclusions of W. S. Wagner, J. Mazzuchelli and their colleagues. These investigators have initiated a paradigm that is essential to the test of any scientific theory: systematic measurement with varied but interrelated instrumentation. In a series of experiments, they measured a number of physical correlates associated with the "spooklight" in Morris County, New Jersey; the light displays many characteristics of low-level UFO phenomena except that the glow diameter is less than 0.3 m (or about one foot). Assuming the validity of the theoretical assumptions in this chapter, the small glow diameter would suggest a very localized and weak EM column that would be less likely to induce damaging consequences in adjacent human observers.

In their report, they noted that the yellowish-white light was visible for a period in the order of 100 seconds. The light appeared beside a railroad track and moved over and parallel with the rails. When it vanished, it disappeared as if it had been "switched off." While the light was under observation, several instrumental changes were recorded. Oscilloscopic displays in the range of 40 kHz were detected and the capacitance test indicated the presence of a conductive body over the rails. Nine minutes after the light had disappeared, full-scale Geiger counter readings (greater than 5 milliroentgen/hr) were noted for about 10 seconds followed by a return to background levels (0.1 to 0.2 mr/hr) followed later by another full-scale reading. Photography indicated the presence of a light source. The observations were made on the night of November 20-21, 1976. A drop of barometric pressure from 29.90 to 29.76, associated with the passage of a cold front, preceded the onset of the phenomenon by about one hour. At the time of the light appearance, a light snowfall was in progress. Interestingly, Wiedemann and his colleagues state that loud booms (-0.25 to +0.38 on the Richter Scale recorded by seismographs) were reported by people several miles from the site on December 5-6.

UFO DISPLAYS AS TECTONOGENIC ELECTROMAGNETIC PHENOMENA: BEHAVIORAL-BIOLOGICAL EFFECTS UPON THE HUMAN ORGANISM

The presentation of the EM column to a human observer would evoke both indirect and direct effects. Indirect effects would probably involve the observer's "labeling" and "interpretation" of the odd stimuli. These responses would reflect primarily the person's prior reinforcement history (experiences). Groups of individuals with different reinforcement histories and different labels for unusual events would be expected to describe the "same stimulus" in significantly different ways (before they talk to each other, i.e., develop a shared reinforcement history). Such problems have been discussed in Chapter 9. Direct effects would involve acute stimulation of the human as a semi-conductor and electronic system. It is often forgotten in UFO contexts that the human being is a delicate electromagnetic instrument. The brain displays continuous and complicated electromagnetic patterns associated with the coding and processing of environmental events. Through conditioning, the human being learns that certain patterns of stimulus input, coded in specific sequences of nervous activity (action potentials), are associated with particular private responses (thoughts, memories, images). Stimulation of those patterns, independent of the usual sensory sources, can elicit private responses that are just as real, to the perceiver, as those evoked by the original environmental sources. Examples of such responses can be found in epileptic behaviors associated with small foci in parts of the brain. These foci are associated with alterations of only a few millivolts in the steady background potentials, yet synchronized discharges of the numerous neurons within the focus are correlated with vivid, realistic imagery that the person experiences as a "real" event. The realism is enhanced when the experiences are similar to what is expected or familiar.

Indirect Effects

Being in close proximity to the hypothetical EM column would generate a number of predictable behaviors from the human. First, if the column potentials had achieved luminogenic potentials, the person would respond with behavioral patterns associated with novel events. Excessive autonomic (emotional) responses characterized by excitement

at one level and fear-related responses at another could be expected to follow. Significant disruption in the normal orderly patterns of behavior would be evident. Escape behaviors, such as "running away," "jumping overboard" or "driving at high speeds" would be typical and may actually exacerbate the intensity of the effect. For example, the initial observation of the odd light may only induce small autonomic changes but as the person initiated escape/avoidance behavior, the intensity and pervasiveness of autonomic changes would increase in a cascade. Some time later the person might be described as "showing cold fear," "freaked out" or "in a state of shock."

Once the autonomic arousal has occurred, the recalled details of the actual event would be questionable at most, especially if emotionally-loaded terms such as "UFO" or "ghost" had been used to describe the encounter. The disruption of normal behavioral patterns (including thinking) following the presentation of the odd stimulus would be sufficient to alter "remembering" of the actual event sequence. Characteristically, the person may say something like "time seemed to stand still" or "it seemed like we flew to the police station," characteristic indicators of disruption or suppression in private responses.

Anthropomorphic Interpretations. No doubt the kinetic characteristics of the luminosities would be interpreted within an anthropomorphic format. As a result, behaviors of the lights would be allocated with human properties and abilities. Approach of the luminosity could be interpreted as "attack," especially if direct effects from the EM column resulted in pain or some alterations in sensory input. Movement of the column in specific directions could be considered "seeking" behavior or as "snooping" or "investigating," while stationary behavior could be called "surveillance." Attenuations of electrostatic potential below luminogenic values due to alterations in tectonogenic sources, charge dissipation or alterations in local air characteristics (e.g., ionization) could be interpreted as "powers of invisibility," "fading into another dimension" and related labels. Depending upon the temporal gradients involved with the decrease in potential, the luminosity may be seen to suddenly disappear (like someone turning off a light) or slowly fade away. One would expect sudden disappearances to be preceded by increased light intensity or associated electric activities. As the column moved along the local fault lines or stress release points, its interaction with appropriate materials would elevate the poten-

tial to values capable of producing luminous discharges. The human observer might comment that the UFO suddenly reappeared some distance away from the point of disappearance. If an assumption was made that the luminosity was an object, then one would be forced to conclude (erroneously) that it had "dematerialized" or "rematerialized."

Superstitious Conditioning. Repeated oscillations around luminogenic values would produce short, recurrent displays that the person would see as "blinking" or "flashing." Such flashes may be interpreted as attempts at communication or as some type of "coded" transmission. Human beings have been conditioned to respond to systematic and/or predictable stimuli in the environment. Culture can be defined as those human organisms sharing specific reinforcement schedules or expectancies. Consequently when any semi-systematic but unknown stimulus is observed in the environment, there is a propensity to allocate "intelligence" to the source as well as the properties of "thinking" and "volition." Movement along linear pathways or "avoidance" of objects or "attraction" towards objects have been common reports of ground-level luminosities. Invariably, these behaviors are interpreted as signs of "intelligence." The committed observer rarely entertains the possibility that linear movement along a highway may only reflect a third factor correlated with both the luminosity and the highway such as a fault line running parallel and beneath the highway or that movements around or towards an object (including a human semi-conductor) may reflect only ordinary responses to conductors and/or dielectrics.

The human using private responses (thinking) as his primary measure of ground-level luminosity behaviors would be prone to gross errors. Maintenance of thoughts (like other behaviors) is a function of the patterns of reinforcement/reward. If a person assumes that the random or semi-random rise and fall of luminogenic potentials (perceived as flashing lights) are communication attempts, then occasional random flashes in an expected "pattern" will tend to reinforce that behavior. For example, suppose the person views such flashes for a 20-minute period during which time approximately 50 to 110 flashes occur. Since by chance alone, some of these flashes will coincide with some signal similar to a code known to the observer, the observer would be reinforced for thinking that some type of communication attempt is in progress. The variable nature of the occasional coincidences in time (a variable interval schedule) would be sufficient to main-

tain that type of thinking and related behavior for long periods of time; this is a normal condition of human behavior.

Because of the autonomically arousing nature of the situation, the human observer would be prone to superstitious conditioning schedules as well. In superstitious conditioning, any response can be reinforced if it accidentally (or by chance) occurs close in time with a rewarding stimulus even though the display of the response is not associated with the actual delivery of the reward. For example, rain dancing occurs in some cultures. This behavior is more likely to occur when severe drought is in progress (i. e., when the group of people are water deprived) than when sufficient water has been received. However as the drought increases so does the probability that rain will occur. At some point, the group approaches the severe deprivation condition and dances. Probabilistically, the rain follows. Even though the two events are functionally independent, the dancing is reinforced since it was displayed (probabilistically, again) before the rain. The behavior may be displayed again in related contexts.

A similar situation might occur to the observer of ground-level UFO displays. Because of the short periods of the display, alterations in the characteristics would have more immediate reinforcement effects upon the observer. For example, suppose the person sits in his car and watches the display. The luminosity blinks on and off in a variable manner. For a few minutes there is no apparent light. As time since the last onset increases, so does the probability that the light will reappear and that the person will say something about the light. The person may say to his companion, "it should appear soon" and within a few seconds the object appears. Although the appearance is quite independent of the observers, the activity might be interpreted as the UFO's ability "to read your thoughts" or "listen in to the conversation" and related anthropomorphic interpretations. Interestingly, these accidental contingencies need occur only once or twice for the behavior to be strengthened. Few investigators ever really test the hypothesis by repeating their behavior several times.

The problems of superstitious conditioning or variable interval conditioning (both of which are difficult to extinguish) have appeared many times in the history of man whenever short-interval, variable interval and cascading natural events have occurred. The number of human lives that have been directly or indirectly lost by normal human responses to these

stimuli must be very large. For example, suppose a natural event similar to the one suggested in this chapter occurred during the Middle Ages in Europe. Let us assume that because of the accumulating stress factors in the area, unusual phenomena began to occur and were manifested for a two-week period. Because of the assumed nature of the phenomenon the number of separate events increase (time between events decrease) as the interval progresses until the subsurface factors are released or attenuated. The human beings in surrounding areas would most likely dismiss the first few events as hearsay or accident. However as the events increased in number the anxiety associated with unknown stimuli would increase. Because the events are presented in variable numbers, large arrays of different explanations and answers may be given and superstitiously reinforced. As the natural events become more bizarre, the anxiety and disruption of social behavior becomes more acute. Once the devil, or other supernatural explanation has been given, a typical response would be to remove the source. A member of the group may be chosen as the source. The selection would be based on "the odd is related to odd principle." Hence people who have shown unusual behaviors in the past may be selected and the group engages in some ritual. The natural events, that would have disappeared anyway, shortly decrease their frequency and the anxiety stimuli are removed. As a result, the behaviors displayed by the group just before the "disappearance" of the events are reinforced. Cultures are replete with rituals related to natural events (volcanoes, eclipses, earthquakes).

It should be remembered that the human observer's contribution to the phenomenon may involve direct features as well. Human beings are mobile, two-meter-high "semiconductors" that are likely to approach unusual events. Movement in the proximity of the column could certainly alter local electrical characteristics and the kinetics of the column (especially small columns). In this situation, the movement of the phenomena in a manner systematically related to the observer's movement would be interpreted as evidence for "intelligence." The event may be perceived to "move away" when approached and hence be evidence that "they want to be left alone," and so on.

Direct Effects

Direct effects of electromagnetic columns, especially

large ones, upon the human being would be considerable; they would occur only within optimal proximity, whether by the close approach of the human, or the coincidental "approach" of the column. Depending upon the width of the column and the EM potentials involved, the human organism could be affected seriously.

Threshold Electric Field Effects. Human beings standing near or within a column displaying high potentials would report behaviors typical of high-voltage, low-current field exposure. Reports of tingling and other odd sensations, oppression in the chest, hair standing on end, or odd smells (ozone) would be expected. If the field had low frequency modulation, direct autonomic stimulation would be expected, such that intense fear responses or 'I'm going to die" responses would be likely.

Paralysis, Epileptic-Like Aura and Blackout Effects. At high voltages, the adjacent human "semiconductor" may become paralyzed or lose body tonus. Periods of paralysis with concomitant dreamy states have occurred when low currents were applied directly to the brain or body. These dreamy conditions, not unlike epileptic auras (the experiences that occur before epileptic discharges), may include sensations as if the body was floating, or as if the self was leaving the body, alterations in time sequences, or sensations of meaningfulness or "cosmic significance." The latter sensations can be induced in human beings by stimulating limbic structures of the brain with weak electric currents. In light of the present labels for unusual events, one would expect frequent reports of "intense psychic experiences" such as out-of-body experiences, "feelings of communion with God," "being at one with the universe" or feelings that something terrible is about to happen.

The paralysis may be variable and range from mild weakness (hypotonous) to an inability to move-something similar to nocturnal akinesis. However a more important aspect of the column-associated stimulation would be the changes in the parts of the brain involved with dream-like images. As mentioned, stimulation of the limbic system (which involves the amygdala and the hippocampus) could allow release of intense images into the private experiences (awareness) of the observer. Stimulation of the hippocampus is known to release dream-like images into awareness. These sequences of images are so vivid that a person may consider them veridical. It has been suspected that the induction of rapid eye

movements (associated with dreaming) in the waking state through direct or chemical stimulation may be responsible for the reports of "hallucinations" and dreamy or "unreal" experiences displayed by many people. In some respects, these occurrences are so frequent they could be considered normal.

Direct stimulation of the brain also could induce epileptic-like auras. The specific brain locus stimulated would depend upon a number of local factors such as level of polarization in brain areas, orientation of the head to the column, and the vectors of current induction. Induction of foci in different functionally specific portions of the brain would be associated with their respective modality experiences. Stimulation of the visual cortical areas could elicit visual experiences. However, one of the more important areas would include the temporal lobe structures (both cortical and subcortical) which appear particularly prone to electrical instability. Transient epileptic foci induced in this portion of the brain could elicit very complex and extraordinarily vivid sequences (especially if the hippocampus is involved). Epileptic stimuli in the vestibular area is known to induce vertigo, clouding of the visual field and inability "to find where one is located." Auditory experiences associated with epileptic auras range from simple sounds to complicated sequences of language or instructions to the perceiver. In many instances, the person may experience a "language" that he does not understand or that appears indecipherable--a phenomenon also reported to occur during dreams. Electromagnetic induction of auditory experiences is not isolated to epileptic foci. Frey (1962) found that very low intensity pulsed (20 to 400 pulses/sec) radio frequencies can be associated with sound experiences like a "buzz," "clock," "hiss" or "knocking" as well as "pins-and-needles" sensations.

Stimulation of adjacent cortical modality projection centers has been known to be associated with experiences characteristic of that area. Epileptic discharges in olfactory regions of the brain are most typically associated with disagreeable odors such as "rotten eggs" and "horrid smells." Induction of visual information in an unstable pattern could evoke an entire sequence of complicated visual images ranging from seeing phosphene-like patterns to complicated human figures. It should be noted that epileptic auras can involve a type of desynchrony between the modalities. For example, the humanoid hallucination may appear to speak without moving the mouth. In this situation, an ad-hoc explanation might be "telepathic communication."

For reasons that are not clear, epileptic auras often involve experiences of modified humanoid forms. These modifictions range from reporting experiences of "little men" to altered body structures (human beings with large heads, altered facial features, no head, no hands, hairy monsters). The range and complexity of the experiences are quite broad and reflect the learning history of the patient. For example, Crosby, Humphrey and Lauer (1962) report one young woman's experience of seeing a "little man dressed in striped trousers that followed her around." One wonders what the diagnosis would have been had she experienced the aura in an isolated wood near a luminous light rather than along a downtown street.

If the EM column was more intense, the induced experiences could be followed by an actual seizure and/or blackout. At the high-voltage (and low-current) levels suggested by the present model, unconsciousness could quickly follow. Like more conventional forms of "convulsive shock," the period just before the blackout would be affected most. Recall of the details of those few minutes just before the shock may be difficult for the subject. In fact, the subject may experience total or partial amnesia of the events. Amnesia is not uncommon in sudden brain traumas whereby the labile and short-term electrical coding of recent information is prevented from long-term consolidation and recall. Severe shocks might elicit anterograde amnesia in which the person may have "no memory" of the interval between the stimulus and later "regaining" of awareness.

Electric shock-induced periods of amnesia can be filled in with confabulation that would be indiscriminable from other memories to the perceiver. The type of information would reflect the learning history, specific information associated with the nature of the unusual situation, and ad hoc verbal labeling. If the person had been in a hospital ward, confabulations/fantasies recalled about the behavior of staff just before the shock would not be considered unusual since the content would be quite probable within the context of the hospital setting. However, if the person had been adjacent to an unusual light associated with UFO stimuli, then the amnesic intervals would be filled in with details that would be given special attention. Information acquired from incidental learning or reading (briefly or partially-observed items in the news media) would be especially influential. Like the epileptic aura and post-traumatic recalls, the details of the period around the blackout would be prefaced by

the dream-like nature of the experience. Many UFO encounters or abductees report a dream-like condition during the alleged contact with the aliens.

Also, one might expect that details of the recall would contain allusions to those parts of the body most influenced by the activity of the EM column. The effect would be similar to the general pattern of details experienced in a dream as a function of the external/internal environment. If you are dreaming in a room that is cold, you may have dream sequences of running nude in the Arctic. If you are dreaming and have congested lungs, you may dream about someone sitting on your chest. One actual case involved a young boy who developed acute pneumonia. He reports a dream where he was alone in a boat surrounded by trees at the tops of which were people throwing rocks at his chest. The rocks hurt when they hit; early the next morning, the patient awoke with acute respiratory discomfort.

In the UFO situation, if the EM column stimulated the top of the head (a likely discharge point), the person could remember a series of images such as "aliens placing equipment on his head" or "samples taken from his head." Direct effects of the respiratory system may result in images like "something was placed on the chest as a part of the test." Stimulation of the genitals--a part of the body that seems frequently incorporated into dream material and dream fantasies--would result in dream images like "the aliens took samples from the genitals." The extremely close similarity between the UFO experience and the ordinary dream experience is an important point. Reports of floating (either of the perceiver or aliens in the dream), sudden appearance and disappearance of objects, and the free-associative jumping of image sequences are common. In the latter situation the free-associative jumping could be rationalized by "they kept putting me to sleep and I kept waking up in different situations." The person might remember an operating table, then another part of the space ship, then being in a strange place with trees, buildings or space ships and then on the ground again.

The severity of the shock and the duration of the amnesic episode would be influenced by the rate of current induction in the human observer nearby (or observers; two or more people could be involved and should, before they talk to each other, have significantly different recalls of the experiences). If the EM column was charged to levels sufficient

to produce luminous displays, close approach of a two-meter-tall human "conductor" would be analogous to a single tall tree on a flat plain during a severe thunderstorm. As the human approached the column, a discharge could occur directly to the person and "knock him out." More distant observers might conclude that a "bolt shot out of the UFO" or the "UFO shot the subject" or offer some other zoomorphic interpretation.

The ensuing amnesia could last from a few minutes to days. The person may "suddenly become conscious" in a standing or lying position at some later time with complete amnesia of the episode. During the amnesia, he would be quite capable of complicated motor movements, even speech. Epileptics, for example, may display complicated motor sequence--even perform surgery!--although these episodes are followed by global amnesia. It is not surprising then that the person would be alarmed when "he suddenly awoke." The anxiety associated with the loss of memory (the reference point of experience) and the nature of the experience may be so intense that the entire behavioral sequence (including confabulation/fantasy) could be suppressed and the person could not "remember." However as he relaxed, the suppressed behaviors would be displayed again.

There is nothing unusual about the behaviors I have described. Such behaviors would be expected. What is unusual is the manner in which the behaviors are interpreted because of their odd or emotionally loaded context.

One necessary aspect of the model involves lethal consequences from close electromagnetic-column encounters. In the previous paragraphs, the assumption has been made that the EM intensities are sufficient to induce localized electrical instabilities in prone portions of the brain (and thus inundate the person with rich, private experiences and images) or to elicit simple paralysis or unconsciousness. On a statistical basis, one would expect that the larger EM columns would be sufficient to electrocute a human, even though the nature of the mechanisms require high electric field potentials and very low currents.

However, if the person was standing in a conductive area with direct contact--was barefoot for example--induced current could produce death. The postmortem would reveal nothing unusual and if there had been no other witnesses the diagnosis probably would be "death by lightning." Peripheral

burns and muscle lesions would be concomitant symptoms. Incidents where the brain of the victim could be analyzed quickly would demonstrate evidence of "electrocution syndrome" typified by proliferation of small holes throughout brain matter. Conductive materials on the body, cigarette lighters, belt buckles, should be melted or demonstrate signs of "arc welding" or "spot welding." One would expect that such reports would be infrequent since the number of conditions that must exist for this to occur (e.g., high conductivity area, grounding of subject, and overlap of a large EM-column space with a person's space), have very low probabilities of occurrence. In addition, such deaths would be diagnosed within conventional frameworks, e.g., electrocution by lightning or high tension wires.

However if the person was situated upon a good conductor, such as a ship, the effects could be quite different. The occurrence of a large EM column over water would have a variety of effects. First, because of no intervening objects (like trees), it would be more easily observed--a factor that may contribute as a confounding variable to the report that low-level UFOs occur frequently over water. Secondly, the presence of the metallic object (ship) within the relatively homogeneous electrical gradients over the water would produce more extensive field deviations for greater distances from the ship and hence increase the likelihood of interaction from the nearby EM column.

As the EM column approached the ship, deviations in compass needles, failure of radio communication (due to "static" on all wavebands), and disturbances in intricate electrical apparatus would occur. As the electrical field strength increased, occupants of the ship would begin to experience "prickling sensations," breathing difficulties and high voltage-related effects. Discharges could ignite fires in petroleum fume (engine) areas or produce large explosions. Direct brain effects would be similar to those reported previously including the experience of vivid images and nightmare dream sequences. If the EM column was intense enough to produce luminosities, then the ship would be seen as "engulfed by a luminous light" or "approached by a luminous light." If the effects became too intense, simple avoidance or escape responses would be displayed by the human beings on the ship such as jumping overboard. Later, people would find the ship floating without anyone on board. On the other hand, if the EM column approached quickly and sudden and intense currents were induced within the outer layers of the ships hull/

walking surface, the crew could be electrocuted. In such instances, evidence of spot welding (e.g., metallic objects such as pails permeated by small pin-point holes) should be evident.

The upper altitude of the EM column has not been specified. However, drawing from knowledge about earthquake lightning, one would expect that significant gradients could be induced up to several thousand feet. In recent years, intense earthquakes have been preceded by significant alterations in lower ionospheric conduction although such changes can be explained by other models. If the EM column could extend to airplane altitudes, then aircraft in the vicinity could be directly affected. Aircraft flying through the region could act as external charge collectors, thus allowing the "sudden appearance of a luminosity" at the area geometrically suited for discharge such as the wing tip or tail tip. Predictably, as the plane moved, the luminosity would move in the same direction and the conclusion that "it was following the plane" would be likely.

Direct effects upon the passengers/pilots would be similar to the changes already mentioned and would be a functioning (primarily) of intensity. A simple blackout of the pilots would be sufficient to seriously affect the safety of the passengers. If the airplane had fuel leaks or areas of fuel fume concentrations, then simple sparking could be sufficient to initiate fires or explode the aircraft. Just before the event, loss of radio communication (static or radio dead spot) would be apparent.

Ionizing Radiation Effects. Since the luminosity could involve plasma-like characteristics and presumably high EM intensities within a small area, ionizing radiation especially in the ultraviolet (UV) range would be likely. If the field strengths were sufficient to produce the luminosity, then the values could be sufficient to elicit ionizing radiation in the vicinity of the column. The close proximity of a human observer to the column under these conditions could produce biological alterations. The extent of the damages would be a function of proximity to the column and the energetic nature of the column. Especially bright luminosities (blinding light) should be more effective (as a rule) than the lower-level pulsating types.

Typical UV-related symptoms would be reported. Inflammation of the eyes and temporary and partial loss of

vision would be apparent the following day accompanied by soreness and irritation. Portions of the skin not protected by clothing or where the clothing touched the skin may become red (sun-burn like) and later be followed by swelling and itching. Depending upon the extent of the exposure, the person may show a sunburn sleeping pattern whereby sleep is characterized by "tossing and turning," repeated awakenings and a low-level feeling of sickness and nausea. Vomitting could occur in some instances.

The mechanisms are unclear by which radiation such as gamma rays or X-rays could be generated. These would be significantly more lethal and could be associated with different symptoms with longer delays of manifestation. For example, following the initial symptoms, recurrent effects would become apparent two to four weeks later. The biomedical symptoms would involve loss of appetite, alterations in white blood cell counts, increased susceptibility to infection, general malaise (which could be interpreted as excessive depression) and related effects. Regression hypnosis or lie detection are hardly effective treatments for such cases; treatment for radiation sickness would be more appropriate.

REEVALUATION OF A CLASSIC CASE

Most, if not all, close-encounter episodes could be accommodated within the model described above. Direct application of the model to a specific, well-documented case might allow a more thorough understanding of the basic theses involved. The case selected for examination is the 1975 Travis Walton incident; the case is recent, involves multiple witnesses and displays typical patterns of other encounters.

The Travis Walton Incident

This purported close encounter with a UFO has been considered by some UFO researchers to be one of the best documented and least likely fraudulent episodes on record. Exact details of the case appear to vary widely, depending upon the reporter and the essential bias of the organization he or she represented. In this chapter, the details from the Aerial Phenomena Research Organization (APRO) have been selected. More detailed information can be obtained from the APRO Bulletin (November 1975) and a recent book by Walton himself (Walton 1978).

The incident is reported as follows. At about 6:15 p. m. on November 5, 1975, seven young men (ages 17 to 28) were driving along a logging road about 15 miles from Heber, Arizona. A few hundred yards from where they had started, one of the men saw a yellowish glow through the trees. As they approached the glow, they saw something luminous in a clearing about 75 to 90 feet from the road. The luminosity was about 15 or 20 feet above a pile of wood and was about 15 feet wide and eight feet high. Young Travis Walton jumped out of the truck and ran towards the light and stood near it; later the other men reported hearing sounds like beeping, generator noises and rumbling. As Walton began to move around the object, a greenish light struck him in the head or chest; the jolt knocked Walton about a foot into the air; he fell to the ground. The whole incident took about one minute after which the remaining men quickly drove away and then returned about 15 minutes later. Walton could not be found.

A few minutes after midnight on November 11, Walton telephoned his relatives from a service station about 12 miles from the area of the encounter six days previous. He sounded weak, vague and confused. Later he drank large amounts of water, ate some cottage cheese and complained of nausea. Walton was in a distressed state for several days following the incident. Tests administered to him demonstrated normal personality characteristics; the statement is made that Walton was not suggestible but this is based upon a questionable measurement (Rorschach test) for the behavior.

Walton related the following series of incidents that he thinks occurred during his "disappearance." After the light hit him, he regained consciousness lying on a table; the ceiling was very close and light came from it. There was some sort of apparatus lying on his lower chest and he had considerable pain throughout his body, especially his head. Around him were three humanoid creatures, all about five feet tall, with large eyes, no hair and small noses, mouths and ears. The remainder of the episode involves Walton wandering through the "spaceship" viewing a chair with push buttons on it, encountering a man who smiled, and traveling through an airlock where he could breathe normally. He remembers viewing several saucers parked in an area and other humans in the vicinity. At this point something like an oxygen mask was placed over his face and he lost consciousness; when he awoke he was lying on his back on a road.

Within the contexts of the model discussed in this paper, the above incident could be reinterpreted in the following manner. A luminosity associated with massive electrical discharge similar to a display of earthquake lightning was viewed by some young men. The potential energetic levels must have been quite large since the visual component itself occupied about 27 cubic meters (942 cu ft). A number of sonic stimuli were associated with the luminosity. Rumbling noises, perhaps associated with subsurface adjustments --a frequent noise in EQL zones or before minor seismic occurrences--were also heard. One of the men (Walton) ran toward this high intensity gradient and stood there. The situation was similar to a two-meter semiconductor standing alone in an open, flat area adjacent to an extremely localized, high-intensity electric field. An electric discharge took place between the column and the nearest apex of the conductor (the man's head/chest). The intensity was sufficient to induce massive neuromuscular discharge (depolarization)--forcing the man into the air (briefly), and into unconsciousness. After being knocked to the ground, he may not have been visible to the other men, already emotionally aroused.

These men drove away quickly and returned within 15 minutes (the reports actually vary). During this period, the motor (neuromuscular) components of the man who had been struck by the EM-column discharge became operable and he walked away from the area. His behavior would be similar to "shock" conditions and the incidental viewer would have labeled him "in a trance" or "sleep walking." During the ensuing period, he may have walked significant distances or remained in a particular area. Available foods and water could still be ingested but there would be no evidence of "awareness." No doubt, he would become dehydrated.

A few days later, the man falls down (most likely from exhaustion); when he "awakes" he cannot remember what has happened during the last few days. Like many amnesia or shock patients, this subject also displays a vivid dream-like experience that is a composite of fantasy, previous associations with the unusual events (preceding the unconsciousness) and actual details. All this information is involved in a typical dream-logic whereby actual temporal sequences and spatial relationships are markedly distorted. The details, like normal dreams, involve images reflecting the parts of the body stimulated. Since the head received a major portion of the initial discharge from the EM column, proprioceptive stimuli from this portion of the body occur in

the recall material. Respiratory arrest or disruption that very likely followed the intense electric shock (and may have produced transient hypoxic effects as well) would be reflected in the images of "an object on his chest" and in the feelings that "the air in the room seemed heavy and moist" and that there had been "severe difficulty breathing."

The details of the confabulation associated with the amnesia display the free-associative and "jumping" characteristics of dreams. Like many dreams, the contents are related by "emotional" or "affective" similarities rather than logical or sequential ones (for example, dreaming about a car may be associated with a series of images of all the cars the dreamer has owned as well as other details that share the same emotional tone; this basic brain operation has been called state-dependent memory).

Consequently, information associated with the word "UFO" is elicited. Various humanoid images, star maps, pilot control chairs, airlocks, helmets, and a parking area for spaceships would be examples. The humanoids displayed the characteristics of the usual stranger in dreams: "aloofness" (not disturbed when signs of aggression were shown), smiles and beckoning. The actual time duration of the processes involved with these fantasies would have involved only a few minutes, most likely immediately before he walked away from the site in a dissociative condition. There is no doubt the experience would be real to the subject, especially considering the context in which it occurred. It would be an inappropriate as well as a fruitless endeavor to determine if he was "lying."

This person should not be considered psychotic or deluded or weird. Instead the seriousness of the biological-behavioral effects from the close encounter with an intense and potentially fatal natural phenomenon should be appreciated properly. The "memories" of the event and the behaviors associated with it should be considered normal within the context of the actual intense physical stimulus, the traumatic consequences and the verbal labels most likely used by the subject to implicitly or explicitly describe the odd light. A similar consequence could have happened to any human being who had been careless (or ignorant) enough to approach this intense, natural event.

Conclusion

Was Travis Walton taken away by aliens or was he traumatically influenced by an electric shock from a natural phenomenon that could have killed him? The answer is insoluble since the event has already occurred and there is no reliable way to explain this incident without incurring the pervasive dangers of after-the-fact conceptualization and rationalization and without using as the primary measure Walton's private responses (memory)--a measure that is highly unreliable in the context of traumatic stimuli. Certainly, the reinterpretation is not proof of the mechanisms suggested. However, this reevaluation is based upon the same data used to postulate a variety of other explanations.

FINAL COMMENT

A theory has been presented in this chapter to accommodate some of the more intense and physical events sometimes associated with close UFO encounters. The assumptions of the theory are based upon known electromagnetic principles in general and the less clear mechanisms of earthquake lightning in particular. The presence of strange, complex dynamics of the luminosities that are associated with subsurface stress are more likely to reflect the unusual and complex nature of the interactions of applied forces than aberrant or unnatural mechanisms.

A few qualitative predictions have been made concerning the physical and behavioral effects of these hypothetical EM columns. However these statements are still much too general and must be supported many times and in many ways with quantitative evidence. Any potential contribution of this theory will be eliminated if the reader attempts to accept it uncritically; one should severely and quantitatively test its specific predictions. Because of the nature of the mechanisms involved, the onus of this task will lie heavily upon the specialists in the physical sciences. Massive interlocking of available space-time UFO data with seismic and geological characteristics of several test areas must still be completed. Like other specific proofs of science, the actual work must be left to the specialists and not to the pulp writers and avid believers in quick answers.

A major feature of the behavioral consequences of the theory is the normal and natural processes involved. As

mentioned in previous chapters of this book, the confounding effects of the verbal human being have been a major source of the elusiveness of the UFO problem. Within the context of this theory, the paralysis, epileptic aura-like experiences, proprioceptive sensations, and interpretations of intelligent action are normal consequences of humans in close proximity to intense, transient electromagnetic forces. If the mechanisms were more clear and the phenomenon more frequent, such as lightning, then the over-reactive mystery surrounding these events would not be evident. However, mechanisms lose their clarity in the midst of an unusual and unexpected stimuli.

The history of science contains repeated instances of infrequent, natural phenomena (volcanoes, eclipses) that generated a complex series of superstitious behaviors within human cultures. Often these behaviors were reinforced by accidental death or injury associated with those events. Within our comfortable and safe presentday perspective, we can comment about the "superstitious" behavior of our ancestors. We are no longer amazed by myths describing someone who saw a dark cloud upon the top of a hill, ran up to "greet it" and was struck by the gods for his impudence. We know now that he functioned as an electric conductor for the discharge of the thunder cloud. The man's memories when he awoke (if he awoke), severely burned and aching, about "floating in the air" after the bolt hit him and talking to the gods of Olympus are no longer impressive. We now understand a little more about the traumatic effects of electric shock upon recall of odd stimuli. As systematic and dispassionate analyses are used, many natural phenomena have lost their bizarre interpretations. The theory in this chapter implies that close UFO encounters involving physical injury and behavioral modifictions is another of these infrequent, transient, terrestrial events that have been occurring for millenia.

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